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10/787,286	02/27/2004	Kazuo Sugimoto	249557US90	4928

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EXAMINER	
YEH, EUENG NAN	

ART UNIT	PAPER NUMBER
2624	

NOTIFICATION DATE	DELIVERY MODE
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/787,286	SUGIMOTO ET AL.	
	Examiner	Art Unit	
	Eueng-nan Yeh	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-10 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-10 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 27 February 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date June 15, 2007.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Specification

2. The title of the invention, "Image Encoding Apparatus, Image Encoding Method, Image Encoding Program, Image Decoding Apparatus, Image Decoding Method and Image Decoding Program" is too general to reveal the real intention to which the claims are directed. A new title is suggested: "Image Encoding/Decoding Apparatus With Matching Pursuits Method For Low Bit Rate".

3. The disclosure is objected to because of the following informality:

Page 1, line 25: the IEEE publication year is missing.

Claim Rejections - 35 USC § 101

4. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.
>
> The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Annex IV, reads as follows:
>
> Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when employed as a computer component. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).) "Nonfunctional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data.

> When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare In re Lowry, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and Warmerdam, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) with Warmerdam, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory).
>
> In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See Lowry, 32 F.3d at 1583-84, 32 USPQ2d at 1035.

5. .Claims 5 and 10 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows. Claims 5 and 10 define a computer program embodying functional descriptive material. However, the claim does not define a computer-readable medium or computer-readable memory and is thus non-statutory for that reason (i.e., "When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized" – Guidelines Annex IV). The scope of the presently claimed invention encompasses products that are not necessarily computer readable, and thus NOT able to impart any functionality of the recited program. The examiner suggests amending the claim(s) to embody the program on "computer-readable medium" or equivalent; assuming the specification does NOT define the computer readable medium as a "signal", "carrier wave", or "transmission medium" which are deemed non-statutory (refer to "note" below). Any amendment to the claim should be commensurate with its corresponding disclosure.

Note:

A "signal" (or equivalent) embodying functional descriptive material is neither a process nor a product (i.e., a tangible "thing") and therefore does not fall within one of the four statutory classes of § 101. Rather, "signal" is a form of energy, in the absence of any physical structure or tangible material.

Should the full scope of the claim as properly read in light of the disclosure encompass non-statutory subject matter such as a "signal", the claim as a whole would be non-statutory. In the case where the specification defines the computer readable medium or memory as statutory tangible products such as a hard drive, ROM, RAM, etc, as well as a non-statutory entity such as a "signal", "carrier wave", or "transmission medium", the examiner suggests amending the claim to include the disclosed tangible computer readable media, while at the same time excluding the intangible media such as signals, carrier waves, etc.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1 to 10 are rejected under 35 U.S.C. 102(b) as being anticipated by Zakhor et al. (US 5,699,121).

Regarding claims 1 (encoding apparatus) and 5 (encoding program), Zakhor discloses:

dictionary storage means for storing a plurality of bases based on a predetermined two-dimensional function for generating a predetermined two-dimensional pattern (as depicted in figure 1, numeral 80 is a pattern library which "includes a large number of signal patterns" at column 4, line 62; "The pattern library 80 consists of discrete 2-D basis functions" at column 8, line 43 and it can be represented by the discrete Gabor function described at column 9, equation (7)),

the predetermined two-dimensional function including parameters for curving the predetermined two-dimensional pattern (the two-dimensional structure "is completely specified by α, β ..." at column 9, line 14, where the vector parameter α: "α = (s, ξ, φ) is a triple consisting respectively of a positive scale, a modulation frequency, and a phase shift. β is defined to be the set of all such triples ..." at column 8, line 60; as depicted in figure12 it is a two-dimensional contour plot of a sample library pattern);

conversion means for decomposing a coding target image by using the plurality of bases on the basis of a predetermined conversion rule (as depicted in figure 1, numeral 60, "the pattern matcher 60 matches selected input patterns with patterns in a pattern library. Preferably, the pattern matcher 60 executes a 'matching pursuits algorithm' ..." at column 7, line 38; see also figure 4, numeral 68 and figure 7),

and converting the coding target image into basis information including index information to a basis used for decomposing the coding target image, a coefficient by which the basis specified by the index information is multiplied, and positional information for specifying a position where a pattern made by multiplying the basis specified by the index information by the coefficient is restored (as depicted in figure 4, numeral 90; see also figure 8 where numeral 92 is an atom parameter signal. "The atom parameter signal segment specifies the best match structure element from the pattern library 80. This element is identified with the values (α, β). The atom parameter signal segment also specifies the location of the best match in the reference frame with (x, y) coordinates. Finally, the atom parameter signal segment specifies the projection of image data at (x, y) onto the selected match element, referred to as 'p'. That is, the best match element from the pattern library is multiplied by a value 'p' ..." at column 5, line 60); and

encoding means for generating compression data including a compression code made by encoding the basis information on the basis of a predetermined compression coding rule (as depicted in figure 9, numerals 100 and 102: "The atom coder 100 performs known quantization and variable length coding operations ..." at column 6, line 25, and "Quantization and variable length coding operations are also performed on the motion vector signal by the motion vector coder 102" at column 6, line 35. As illustrated in figure 9, the data will finally go through numerals 104 and 106 to complete the generation of compressed data which includes a compression code.)

Regarding claim 2, Zakhor discloses:

a conversion step in which conversion means decomposes a coding target image on the basis of a predetermined conversion rule by using a plurality of bases stored in dictionary storing means (as depicted in figure 1, numeral 60, "the pattern matcher 60 matches selected input patterns with patterns in a pattern library. Preferably, the pattern matcher 60 executes a 'matching pursuits algorithm' ..." at column 7, line 38; see also figure 4, numeral 68 and figure 7),

and converts the coding target image into basis information including index information to a basis used for decomposing the coding target image, a coefficient by which the basis specified by the index information is multiplied, and positional information for specifying a position where a pattern made by multiplying the basis specified by the index information by the coefficient is restored (as depicted in figure 4, numeral 90; see also figure 8 where numeral 92 is an atom parameter signal. "The atom parameter signal segment specifies the best match structure element from the pattern library 80. This element is identified with the values (α, β). The atom parameter signal segment also specifies the location of the best match in the reference frame with (x, y) coordinates. Finally, the atom parameter signal segment specifies the projection of image data at (x, y) onto the selected match element, referred to as 'p'. That is, the best match element from the pattern library is multiplied by a value 'p' ..." at column 5, line 60),

wherein the plurality of bases are based on a predetermined two-dimensional function for generating a predetermined two-dimensional pattern (as depicted in figure 1,

numeral 80 is a pattern library which "includes a large number of signal patterns" at column 4, line 62; "The pattern library 80 consists of discrete 2-D basis functions" at column 8, line 43 and it can be represented by the discrete Gabor function described at column 9, equation (7)) , and

the predetermined two-dimensional function includes parameters for curving the predetermined two-dimensional pattern (the two-dimensional structure "is completely specified by α, β ..." at column 9, line 14, where the vector parameter α: "$\alpha = (s, \xi, \varphi)$ is a triple consisting respectively of a positive scale, a modulation frequency, and a phase shift. β is defined to be the set of all such triples ..." at column 8, line 60; as depicted in figure12 it is a two-dimensional contour plot of a sample library pattern); and

an encoding step in which encoding means generates compression data including a compression code made by encoding the basis information on the basis of a predetermined compression coding rule (as depicted in figure 9, numerals 100 and 102: "The atom coder 100 performs known quantization and variable length coding operations ..." at column 6, line 25, and "Quantization and variable length coding operations are also performed on the motion vector signal by the motion vector coder 102" at column 6, line 35. As illustrated in figure 9, the data will finally go through numerals 104 and 106 to complete the generation of compressed data which includes a compression code.)

Regarding claim 3, the predetermined two-dimensional function further includes parameters for making the predetermined two-dimensional pattern move, rotate, and

expand and shrink in two directions ("The pattern library 80 consists of discrete 2-D basis functions (library patterns 82) ..." at column 7, line 43, "The matching pursuits algorithm expands a signal using an overcomplete basis of Gabor functions. The functions are scaled, shifted, and modulated versions of a Gaussian window function" at column 7, line 43; see also column 8, equation 6 is the discrete Gabor functions as a set of scaled, modulated Gaussian windows where the vector parameter α: "$\alpha = (s, \xi, \varphi)$ is a triple consisting respectively of a positive scale, a modulation frequency, and a phase shift. β is defined to be the set of all such triples ..." at column 8, line 60; see also figure12 it is a two-dimensional contour plot of a sample library pattern).

Regarding claim 4, the encoding means incorporates the parameters of each of the plurality of bases stored in the dictionary storage means in the compression data (as depicted in figure 9, where the atom coder #100 gets parameters from library pattern match #60 and #80, and then compress it "The atom coder 100 performs known quantization and variable length coding operations. The quantization operation transforms the coefficients of the atom parameter signal into bits ..." at column 6, line 25).

Regarding claim 6 (decoding apparatus) and 10 (decoding program), Zakhor discloses:

dictionary storage means for storing a plurality of bases based on a predetermined two-dimensional function for generating a predetermined two-dimensional pattern (as

depicted in figure 1, numeral 80 is a pattern library which "includes a large number of signal patterns" at column 4, line 62; "The pattern library 80 consists of discrete 2-D basis functions" at column 8, line 43; and can be represented by the discrete Gabor function described at column 9, equation (7)),

the predetermined two-dimensional function including parameters for curving the predetermined two-dimensional pattern (the two-dimensional structure "is completely specified by α, β ..." at column 9, line 14, where the vector parameter α: "$\alpha = (s, \xi, \varphi)$ is a triple consisting respectively of a positive scale, a modulation frequency, and a phase shift. β is defined to be the set of all such triples ..." at column 8, line 60; as depicted in figure12 it is a two-dimensional contour plot of a sample library pattern);

decoding means for decoding compression data and generating a basis information (as depicted in figure 9, numerals 26 and 110: "The matching pattern decoder 26 performs operations which are the inverse of those performed by the matching pattern coder 22. In particular, the atom decoder 110 performs inverse variable length coding and quantization operations to recover the atom parameter signal ..." at column 6, line 46),

the compression data including a compression code made by encoding the basis information including index information to a basis used for restoring a decoding target image, a coefficient by which the basis specified by the index information is multiplied, and positional information for specifying a position where a pattern made by multiplying the basis specified by the index information by the coefficient is restored (as depicted in figure 4, numeral 90; see also figure 8 where numeral 92 is an atom parameter signal. "The atom parameter signal segment specifies the best match structure element from

the pattern library 80. This element is identified with the values (α, β). The atom parameter signal segment also specifies the location of the best match in the reference frame with (x, y) coordinates. Finally, the atom parameter signal segment specifies the projection of image data at (x, y) onto the selected match element, referred to as ‘p’. That is, the best match element from the pattern library is multiplied by a value ‘p’ …” at column 5, line 60); and

inverse conversion means for generating the decoding target image by applying a predetermined inverse conversion rule to the basis information decoded by the decoding means (as depicted in figures 1 and 9, numerals 80 and 112 under the decoder #26: “The atom parameter signal is then passed to the pattern fetcher 112. The pattern fetcher 112 uses the information in the atom parameter signal to identify a selected pattern in the pattern library 80. The selected pattern is then used to form a coded residual signal” at column 6, line 50. Finally, it will combine with #116 to generate the reconstructed video signals i.e. the decoded target image.)

Regarding claim 7, Zakhor discloses:

a decoding step in which decoding means decodes compression data (as depicted in figure 9, numerals 26 and 110: “The matching pattern decoder 26 performs operations which are the inverse of those performed by the matching pattern coder 22 …” at column 6, line 46)

including a compression code made by encoding basis information including index information to a basis used for restoring a decoding target image on the basis of a

predetermined inverse conversion rule among a plurality of items of index information to a plurality of bases stored in dictionary storage means, a coefficient by which the basis specified by the index information is multiplied, and positional information for specifying a position where a pattern made by multiplying the basis specified by the index information by the coefficient is restored (as depicted in figure 4, numeral 90; see also figure 8 where numeral 92 is an atom parameter signal. "The atom parameter signal segment specifies the best match structure element from the pattern library 80. This element is identified with the values (α, β). The atom parameter signal segment also specifies the location of the best match in the reference frame with (x, y) coordinates. Finally, the atom parameter signal segment specifies the projection of image data at (x, y) onto the selected match element, referred to as 'p'. That is, the best match element from the pattern library is multiplied by a value 'p' ..." at column 5, line 60),

wherein the plurality of bases are based on a predetermined two-dimensional function (as depicted in figure 1, numeral 80 is a pattern library which "includes a large number of signal patterns" at column 4, line 62; "The pattern library 80 consists of discrete 2-D basis functions" at column 8, line 43; and can be represented by the discrete Gabor function described at column 9, equation (7))

which generates a predetermined two-dimensional pattern and includes parameters for curving the two-dimensional pattern (the two-dimensional structure "is completely specified by α, β ..." at column 9, line 14, where the vector parameter α: "$\alpha = (s, \xi, \varphi)$ is a triple consisting respectively of a positive scale, a modulation frequency, and a phase

shift. β is defined to be the set of all such triples ..." at column 8, line 60; as depicted in figure12 it is a two-dimensional contour plot of a sample library pattern);

an inverse conversion step in which inverse conversion means generates the image for decoding by applying a predetermined inverse conversion rule to the basis information decoded by the decoding means (as depicted in figures 1 and 9, numerals 80 and 112 under the decoder #26: "The atom parameter signal is then passed to the pattern fetcher 112. The pattern fetcher 112 uses the information in the atom parameter signal to identify a selected pattern in the pattern library 80. The selected pattern is then used to form a coded residual signal" at column 6, line 50. Finally, it will combine with #116 to generate the reconstructed video signals i.e. the decoded target image.)

Regarding claim 8, the predetermined two-dimensional function further includes parameters for making the predetermined two-dimensional pattern move, rotate, and expand and shrink in two directions ("The pattern library 80 consists of discrete 2-D basis functions (library patterns 82) ..." at column 7, line 43, "The matching pursuits algorithm expands a signal using an overcomplete basis of Gabor functions. The functions are scaled, shifted, and modulated versions of a Gaussian window function" at column 7, line 43; see also column 8, equation 6 is the discrete Gabor functions as a set of scaled, modulated Gaussian windows where the vector parameter α: "$\alpha = (s, \xi, \varphi)$ is a triple consisting respectively of a positive scale, a modulation frequency, and a phase shift. β is defined to be the set of all such triples ..." at column 8, line 60; see also figure12 it is a two-dimensional contour plot of a sample library pattern).

Regarding claim 9, the decoding means makes the dictionary storing means store the plurality of bases on the basis of parameters for generating each of the plurality of bases included in the compression data (as depicted in figure 8 where numeral 92 is an atom parameter signal: "The atom parameter signal segment specifies the best match structure element from the pattern library 80. This element is identified with the values (α, β). The atom parameter signal segment also specifies the location of the best match in the reference frame with (x, y) coordinates ..." at column 5, line 60; " "the atom decoder 110 *(figure 9)* performs inverse variable length coding and quantization operations to recover the atom parameter signal ..." at column 6, line 48. Once the atom parameter signal is recovered then the plurality of bases for the dictionary storing can be reconstructed because the 2-D basis structure "is completely specified by α and β ..." at column 9, line 14.)

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Zakhor et al. (US 7,003,039 B2): matching pursuit dictionary is synthesized to achieve low bit rate signals with higher signal-to-noise ratio.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eueng-nan Yeh whose telephone number is 571-270-1586. The examiner can normally be reached on Monday-Friday 8AM-4:30PM EDT.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian P. Werner can be reached on 571-272-7401. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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